

1 IN THE DRAWINGS

2 The enclosed replacement sheets are intended to replace the original sheets of Figure 1
3 and 2A-2B. Applicants designate each of the enclosed annotated sheets of Figures 1
4 and 2A-2B with the legend "prior art."

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REMARKS

This amendment responds to the Office action of September 10, 2007. Applicants amend claims 1, 2, and 14. Claims 1-29 and 34 are pending. Applicants appreciate the PTO interview of March 8, 2008 and request reexamination and reconsideration of the application.

On page 2 of the Office action, prior to the numbered sections, the Examiner states claim 34 is rejoined to the Group I (i.e., claims 1-29).

The Examiner also suggests Figures 1 and 2A-2B be designated prior art. Applicants designate drawing Figures 1 and 2A-2B as prior art.

In sections 1-2, the Examiner rejects claims 1-2, 9-15, and 22-29 under 35 USC 103(a) as being unpatentable over US Patent No. 6,630,631 to Dishongh (Dishongh) in view of the admitted prior art that is Figures 1 and 2A-2B (APA).

Dishongh and the APA cannot render obvious amended claim 1, because Dishongh and the APA fail to describe (1) a conductive pad that extends beyond the solderable terminal sides of the surface mount component to increase solder formation between the conductive pad and the solderable terminal sides and to reduce solder formation at the first plated via and (2) a surface mount component package has an upper surface with solderable terminal sides and a terminal end both as recited in the body of amended claim 1.

Our invention provides a very different solution than Dishongh's via plugs to the solder wicking problem described in the APA. As illustrated in our Figure 4A, the solder mask 54 exposes a part of the conductive pads (e.g., the arms 96, 97) that extends beyond terminal sides 75, 76 of the component 53 to facilitate solder formation (e.g., solder joints 41, 51) between the conductive pad and the terminal sides 75, 76. The solder mask 50 prevents solder formation at the terminal end to reduce solder formation at the first plated via 55. Dishongh's solder ball disposed directly over the plated via increases solder wicking and requires via plugs to avoid solder wicking into the plated via as shown in Figures 2 and 5-7.

1 Further, Dishongh's ball grid array (BGA) package has no solderable terminal sides on
2 its upper surface for connecting to the PCB as shown in Figure 2. Instead, Dishongh's
3 BGA package connects to the PCB through an array of solder balls formed on the
4 bottom surface of the package (See Figures 1-2, col. 1, lines 13-30 and col. 2, line 51
5 through col. 3, line 25).

6 Amended claim 1 captures these differences in requiring a substrate with a via and pad
7 structure connecting a surface mount component to conductive layers of the substrate,
8 comprising:

9 a surface mount component, wherein the surface mount component includes a
10 package having an upper surface with solderable terminal sides and a terminal end;

11 a substrate;

12 a plated via connected to the conductive layers;

13 a solder mask surrounding the plated via; and

14 a conductive pad with a conductive trace connected to the plated via, wherein the
15 solder mask exposes a part of the conductive pad that extends beyond the solderable
16 terminal sides of the surface mount component to increase solder formation between
17 the conductive pad and the solderable terminal sides and to reduce solder formation at
18 the first plated via.

19 Figure 4A and paragraph 0021 of published specification, for example, support this
20 amendment to claim 1.

21 In view of the above, amended claim 1 and its dependent claims 2, 9-15, and 22-29 are
22 patentable over Dishongh and the APA.

23
24 Dependent claim 2 is separately patentable as amended, because it further requires
25 that the solder mask covers a part of the conductive pad that extends beyond the
26 solderable terminal end and reduces solder formation at the terminal end of the surface
27 mount component. Dishongh and the APA clearly fail to teach or suggest amended
28 claim 2.

1 Dependent claims 3 -13 are also separately patentable because each claim further
2 requires, among other limitations, the limitations of amended claim 2.

3 In sections 3-4 of the Office action, the Examiner rejects claims 3-8 and 16-21 under 35
4 USC 103(a) as being unpatentable over Dishongh in view of APA and further in view of
5 US Patent No. 5,384,433 to Osann, Jr. et al. (Osann).
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7 As mentioned above, Dishongh's BGA package increases solder wicking, requires via
8 plugs and has no solderable terminal sides on the upper surface. Dishongh's package
9 instead connects through the solder balls on the bottom surface of the package.

10 Osann fails to make up for the basic deficiencies of Dishongh and the APA. For
11 example, Osann fails to provide a solder mask on the conductive pads (see e.g., the
12 lands 50, 52, 54, and 56 in Figure 5). As shown in Figure 5, Osann's exposed lands
13 extend beyond the solderable terminal ends of components 46 and 48 will generate
14 solder formation, which promotes solder wicking into the via holes. Thus, Osann
15 provides no solution much less recognition of the solder wicking problem.

16 Amended claim 14 captures these differences in requiring a substrate with a plurality of
17 via and pad structures connecting a surface mount component to conductive layers of
18 the substrate, comprising:

19 a surface mount component, wherein the surface mount component includes a
20 package having an upper surface with first solderable terminal sides and a first terminal
21 end and second solderable terminal sides and a second terminal end;

22 a substrate;

23 a first plated via connected to the conductive layers;

24 a first solder mask surrounding the first plated via;

25 a second plated via connected to an associated conductive layer;

26 a second solder mask surrounding the second plated via;

27 a first conductive pad with a conductive trace connected to the first plated via,
28 wherein the first conductive pad includes a portion that is exposed to solder and
29 extends beyond the first solderable terminal sides of the surface mount component to
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1 increase solder formation along the first solderable terminal sides and to reduce solder
2 formation at the first plated via; and

3 a second conductive pad with a conductive trace connected to the second plated
4 via, wherein the second conductive pad includes a portion that is exposed to solder and
5 extends beyond the second solderable terminal sides of the surface mount component
6 to increase solder formation along the second solderable terminal sides and to reduce
7 solder formation at the second plated via.

8 In view of the above, amended claim 14 and its dependent claims 16-21 are patentable
9 over Dishongh, the APA, and Osann for at least the reasons presented in connection
10 with amended claim 1. Claims 3-8 depend from allowable claim 1.

11 In addition, dependent claims 15-28 are separately patentable because each claim
12 further requires, among other limitations, that the first solder mask covers and reduces
13 solder formation at the first terminal end of the surface mount component and the
14 second solder mask covers and reduces solder formation at the second terminal end of
15 the surface mount component.

16 Please call if you have any question or comment regarding this amendment.
17

18 Respectfully Submitted,

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Annotated Sheet

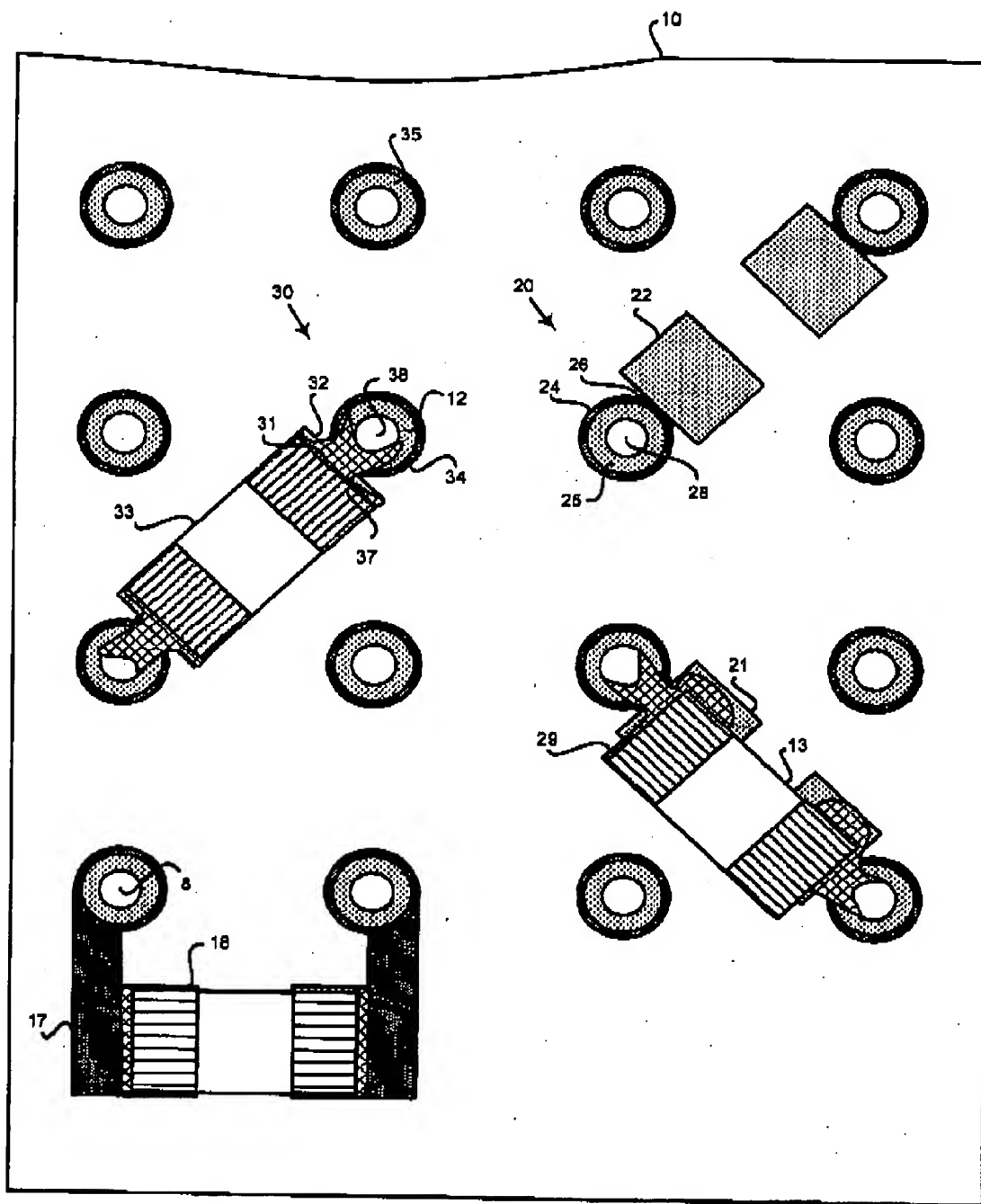


FIGURE 1 - Prior Art

Annotated Sheet

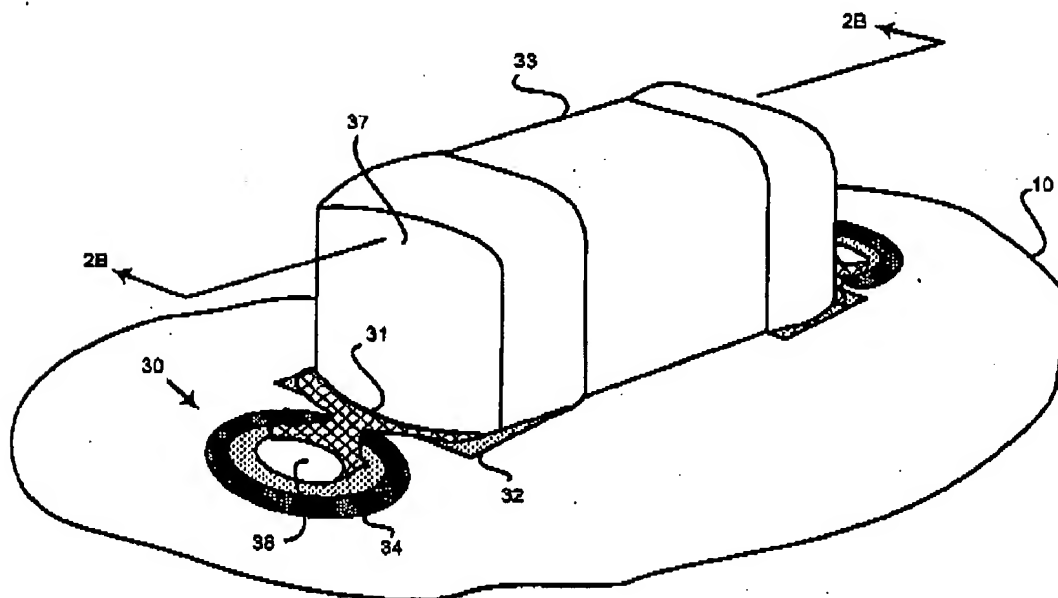


FIGURE 2A - Prior Art

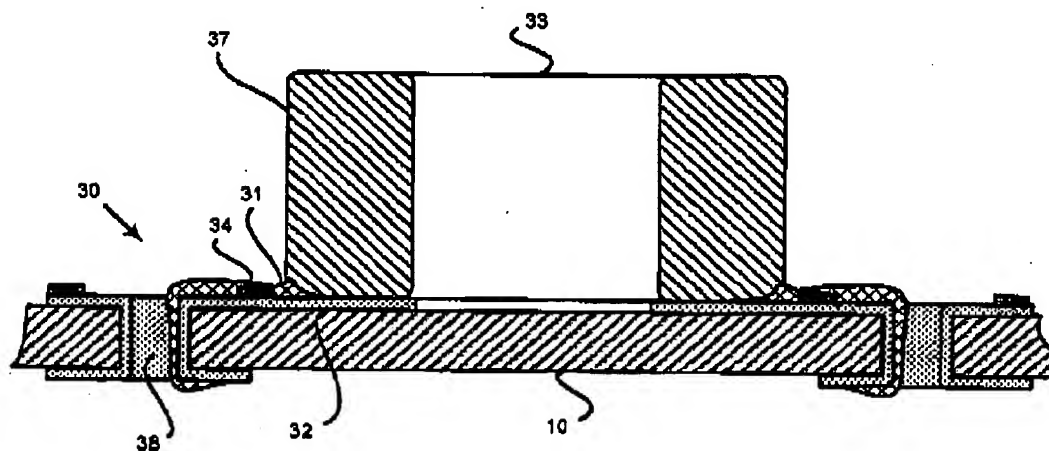


FIGURE 2B - Prior Art